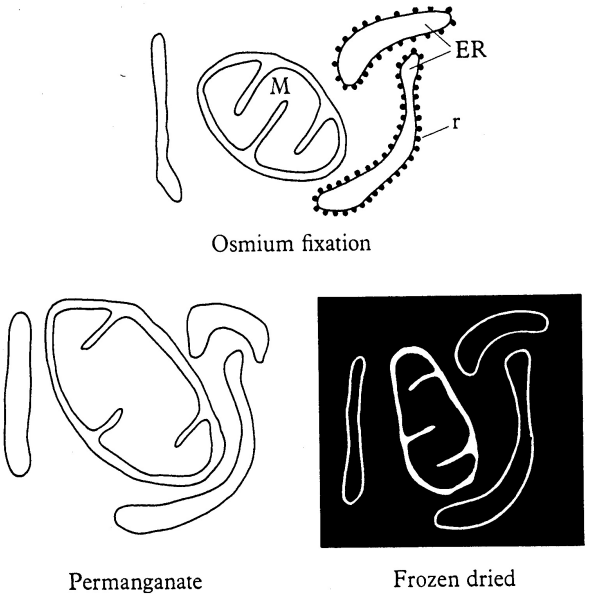

Figure 4.5. A schematic comparison of the effects of three different preparations – staining with osmium, staining with permanganate, and freeze-drying – on mitochondria (M), endoplasmic reticulum (ER), and ribosomes (r). Reproduced with permission from G. H. Haggis, D. Michie, K. B. Roberts, and P. M. B. Walker (1964), *Introduction to molecular biology.* New York: John Wiley and Sons, Inc, Figure 5.1 on p. 114.

the operation of osmium vapors, Porter and Kallman explored the effect of extending the time of fixation from ten minutes to sixteen hours. They reported that with longer fixation "the formed bodies (the majority limited by membranes) become more sharply defined, while the diffuse and frequently fibrous components of the ground substance are removed" (Porter & Kallman, 1952). The following year Porter and Kallman (1953) proposed that this was due to the materials of the matrix being decomposed to a state that allows them to diffuse out of the cell. Finally, they used osmium tetroxide to treat various homogenous materials, both lipid and protein, that were similar to those thought to occur in cells. With albumin and fibrinogen they reported the initial formation of a gel followed by return to a liquid state and argued that this corresponded to the effect in osmium fixed cells of an initial staining of a variety of materials followed by removal of the fibrous components.

Palade (1952b) undertook a systematic study of osmium fixation at different pH values. He found, for example, that unbuffered osmium resulted in acidity upon first contact with cell tissue, but that osmium buffered with